THE METAL INDUSTRY

With which is Incorporated The Aluminum World,
The Brass Founder and Finisher and Electro Platers Review.

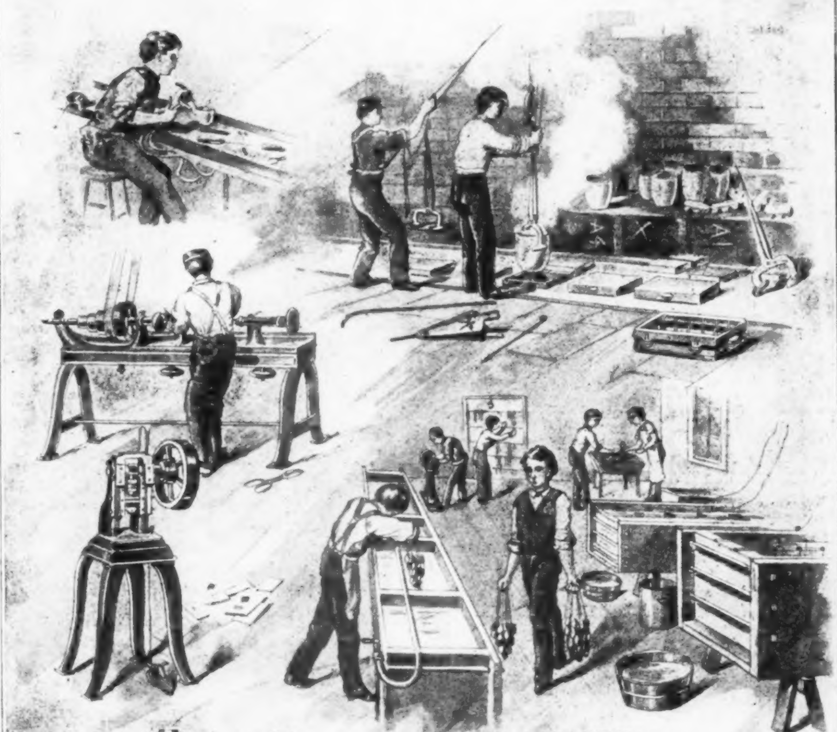
TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

ALUMINUM · COPPER

METALLOGRAPHY · BRASS · METALLURGY

NICKEL · SILVER · GOLD

ROLLING · DRAWING · STAMPING · SPINNING · TUBE-MAKING · POLISHING ·



MELTING · CASTING · REFINING · SOLDERING · BRAZING · PLATING ·

TIN · LEAD · ZINC

OLD SERIES Vol. IX., No. 8
Vol. I., No. 8 NEW SERIES

BRONZE

LABOR OMNIA VINCIT

AUGUST, 1903

NEW YORK.

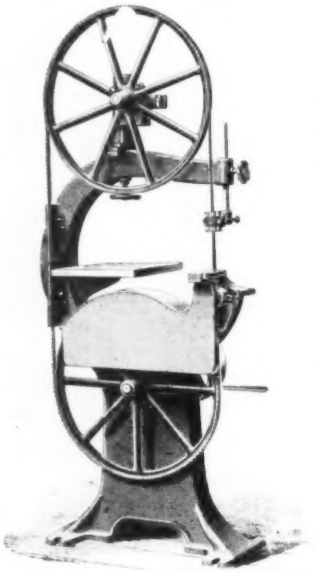
61 BEEKMAN ST.

$1.00 PER YEAR 10 CTS PER COPY

Entered February 10, 1903, at New York, N. Y., as second-class matter under act of Congress. March 3, 1879.

OUR BAND SPRUE SAW

Costs less than half the cheapest power cutter. It will saw heavier work than can be cut.



It shaves off fins and sprues close up to the casting, so that grinding is unnecessary.

Satisfy yourself without cost; we send them on approval.

For Copper, Brass and Aluminum

Loose leaf giving full description

Have you a copy of Catalog 11, modern equipment for the brass foundry?

BRASS FOUNDERS' SUPPLY COMPANY,

NEWARK, N. J.

Have you tried

The

GAUTIER CRUCIBLE??

Manufactured for 45 Years by

J. H. GAUTIER & CO.

JERSEY CITY, N. J.

FOR THE AJAX METAL COMPANY'S ADVERTISEMENT—See Back Cover.

L. VOGELSTEIN

90-96 Wall St., NEW YORK

REPRESENTING

ARON HIRSCH & SOHN

Halberstadt, Germany

Metal Dealers and Refiners

COPPER AND BRASS ROLLING AND TUBING MILLS

TEN MILES OF CHAIN PER DAY

(Cut shows our Triumph Pattern)

TWICE THE STRENGTH OF WELDED

is what our chain shows in steel, and you will be surprised at its strength in other metals. Send for samples and data.

THE ONLY STRONG ALUMINUM CHAIN

THE BRIDGEPORT CHAIN CO., BRIDGEPORT, CONN.

Electro Plating Outfits

FOR ALL PURPOSES

Dynamos and Supplies

The **HANSON & VAN WINKLE Co.,**

Newark, N. J. *Chicago* *New York*

NOTICE. MATERIAL FOR DRYING PURPOSES SILVER, NICKEL PLATERS AND BRASS GOODS MFRS.

Write for prices to **John Sommer's Sons,** 355-365 Central Ave., Newark, N. J.

1872—1903

A STRAIGHT STRETCH OF SUCCESS

The most carefully finished crucibles. This is what McCullough-Dalzell's are universally conceded to be. Finish by itself means nothing. Allied with perfect material and construction, it indicates the thoroughness of our methods.

If Interested Write

The McCullough-Dalzell Crucible Company

PITTSBURG, PA.

THE METAL INDUSTRY

With which is Incorporated The Aluminum World,
The Brass Founder and Finisher and Electro Platers Review.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS

OLD SERIES
VOL. IX., NO. 8.

NEW YORK, AUGUST, 1903

NEW SERIES
VOL. I., NO. 8

THE METAL INDUSTRY
AND
The ALUMINUM WORLD
AND
The BRASS FOUNDER AND FINISHER
AND
ELECTRO PLATERS REVIEW

PUBLISHED MONTHLY BY

THE METAL INDUSTRY PUBLISHING COMPANY,

(Incorporated)

61 Beekman Street, New York

PALMER H. LANGDON, - - - - - *Publisher*
ERWIN S. SPERRY, - - - - - - *Editor*
JOHN B. WOODWARD, - - - - - *Director*

Subscription Price $1.00 per year, postpaid to any part of the world. Single copies, 10 cents

ADVERTISING RATES ON APPLICATION

Entered February 10, 1903, at New York, N. Y., as Second Class Matter Under Act of Congress March 3, 1879.

A LAWSUIT OVER ZINC ASHES

As far as we are able to learn there is no one in the United States who smelts zinc ashes, although, of course, all metal dealers buy them. The greater part of this material is shipped abroad, principally to Swansea, Wales. As large amounts of zinc drosses and ashes are produced by the makers of spelter castings and by galvanizers, a celebrated lawsuit which has recently been carried on in England and just decided may prove of interest.

The suit was brought by Francis Horton, a galvanizer of Wolverhampton against Messrs. Leaver & Co., of Swansea, spelter-makers. The action was brought to recover some $250, a balance due on account of a sale of zinc ashes, a waste product in galvanizing, to the defendant. The terms of the contract were that the zinc ashes purchased should be the same or an equal quality as those heretofore furnished. The purchasers, however, said that the goods were not "zinc ashes," but "washed flux skimmings." Mr. Horton, the plaintiff said that he had had trouble with the purchasers before he had sold them this lot on account of the ashes not running uniform.

The galvanizer (the plaintiff) stated that zinc ashes were never uniform, but depended upon the condition of the furnace. He said that flux skimmings were what were produced in the ordinary condition of affairs. If, however, the furnace remained inactive for some time zinc ashes were formed. The percentage of zinc in the ashes is much larger than in the skimmings. The defendants said the case hinged on whether the goods supplied were marketable zinc ashes. Expert evidence introduced showed that if the ashes contained 50 per cent. of zinc they were marketable. Any larger amount had no bearing on the question. The ashes in question, however, contained only 42 per cent.

The evidence of another galvanizer was introduced which showed that zinc ashes often contain as little as 32 per cent. of zinc. This witness thought that $30.00 per ton for ashes which contained over 42 per cent. of zinc was a good, but not excessive, price. Messrs. Leaver & Co., the defendants, stated that ashes which only contained 40 or 45 per cent. of zinc would not be marketable at all,

They had never purchased any ashes containing less than 55 per cent. of the zinc.

The judge decided that, inasmuch as there had been no correspondence between the plaintiff and defendant regarding any stipulated percentage of zinc, and as ashes below 55 per cent. had no value to the defendants, he should hold that the plaintiff (the galvanizer) had not made out his case.

This decision and testimony is interesting to us for the reason that this material as well as other varieties of drosses are constantly being sold in our own country on the basis of "the same as last." We are of the belief that in the majority of such instances, both parties actually act in good faith, but that certain abnormal conditions in making the dross render it less valuable than previously. Contracts are made agreeing to take the entire output of dross of a manufacturer when the only basis the buyer has is a sample lot. The difference of a few per cent. of contained metal often destroys the profit. It is not surprising, then, that controversies are constantly arising.

THE TEMPERATURE OF CASTING SHOPS

It is quite natural that the temperature of a casting shop should be somewhat high, especially during summer, but it is believed that the majority of persons have no conception of the height to which the temperature rises in this department of the brass industry. Persons have told us that they have seen the temperature in a brass casting shop, where the ventilation was poor, so high that spelter could not be broken. When an attempt was made to perform this ordinarily easy operation the spelter plates simply bent double without fracture. Now it is a well-known fact that spelter becomes soft, so that it may be rolled or drawn, at a temperature of from 212° to 300° Fahrenheit, so that even at the minimum temperature at which spelter becomes soft water would boil. Of course this statement must be somewhat qualified in order to be acceptable, as a caster could hardly stand a temperature of boiling water for any length of time. Spelter is often laid near the furnace and so becomes much hotter than the surrounding atmosphere and in this condition remains in a plastic condition. Indeed, we have often seen spelter act in this manner under such conditions. The casting shop temperature, therefore, is actually more apparent than real.

A case was recently brought to our notice, however, of the temperature of a casting shop being abnormally high, especially near the ceiling. The thermometer reached 209° by actual measurement but this happened to be one of the shops where ventilation was very poor. We doubt whether any of the well designed casting shops ever develop this temperature.

To obtain $9,600 out of a carpet which originally cost only $300, would be usually considered an impossible feat, but such was recently done at the San Francisco Mint. This carpet has been in use six years, and after being burned in the sweeps furnace, the ashes produced $9,600 worth of gold.

DIFFICULTIES WITH ALUMINUM CASTINGS

Inasmuch as we are constantly hearing of difficulties with aluminum castings we desire to put ourselves on record as saying that the greater part of such troubles are caused by the use of aluminum-zinc alloys. We hear complaints about the metal cracking, about the difficulty in obtaining strong castings except in isolated instances, and about the castings having shrinkage pockets to ruin the work.

There are no more alluring alloys than those of aluminum and zinc. They are cheap, possess much stiffness and strength, and melt at a low temperature. They appear to be much more free from the matter of blowholes than the aluminum-copper alloys and work better in machining. The alloy consisting of three parts of aluminum and one of zinc is the best of the series as regards strength and if properly cast will give a strength of 35,000 pounds in green sand castings. When all these considerations are realized, it is not surprising that the aluminum-zinc alloys should take precedence over the others.

These aluminum-zinc alloys, however, possess the property of red-shortness in a considerable degree; in fact, they behave quite similarly to spelter, one of the most difficult metals to cast. Certain shapes may be cast with perfect results while others seem to defy all attempts at sound casting. Loose ramming of the sand, proper gating and cold pouring will, to a certain degree, obviate such troubles, but in thin light castings the metal must be poured "hot" in order to get the casting to run and hence the cracking.

We would suggest that, when difficulties have been experienced in casting the aluminum-zinc alloys, the alloys of aluminum and copper be tried. With ordinary care the castings will be free from cracks as this alloy does not appear to be as red-short as those containing zinc.

ENGLISH BRASS ROLLING-MILL PROFITS

It is natural for us to desire to know whether our relatives are accumulating more wealth than ourselves. For this reason, the recent report of The Kings Norton Metal Company, Limited, of Birmingham, England, one of the largest English brass rolling-mills, is interesting.

For the fiscal year ending March 31, 1903, the report states that the profit has been $142,960, which, with a balance of $2,200 brought forward, makes a total of $145,160. Of this amount, $25,000 was appropriated by the directors for depreciation. They then recommended dividends to be paid at the rate of 7 per cent. on the preferred stock and 10 per cent. on the common stock, and in addition a bonus of fifty cents per share on the common stock. This leaves $22,160 to be carried forward.

While this is certainly an excellent showing, considering the competition that exists in the English brass trade, we are pleased to say that many of our own brass rolling-mills have, for the same period, made profits and paid dividends far in excess of this amount.

A NEW GERMAN CRUCIBLE FURNACE

A new form of crucible furnace recently made its appearance in Germany and is now being used to a considerable extent in that country. The furnace is known as the "*Excelsior*" and is being introduced by the well-known firm of Edouard Clerc & Cie., Ltd. This furnace serves to indicate the tendency now being made in furnace construction towards the utilization of the waste heat in warming up the metal before it is actually melted.

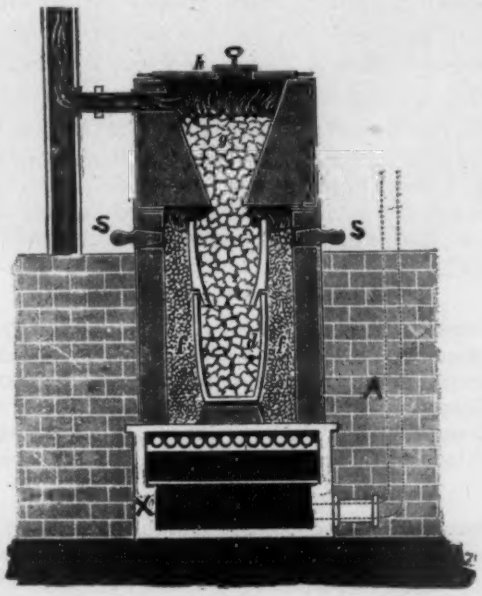


FIG. 1.

The usual form of graphite crucible is used and brass, bronze, copper, nickel and all alloys may be melted in it as well as iron and steel. The following results are guaranteed by this firm and indicate the advantage of utilizing the waste heat.

For Melting Brass, Bronze or Copper.

Time required for melting first charge	40—65 min.	Coke consumption 12—24 per cent. of metal charge
Time required for melting subsequent charges	28—40 min.	

For Melting Nickel.

Time required for melting first charge	50—70 min.	Coke consumption 18—28 per cent. of metal charge
Time required to melt subsequent charge	35—50 min.	

In the ordinary type of crucible furnace using coke for fuel and with or without a blast, the fuel consumption is 50 to 100 per cent. of the metal, so it will be seen that this new type of furnace is quite economical. Messrs. Edouard Clerc & Cie. cite the subjoined examples of the fuel consumption of three types of furnaces, viz.:—

Furnace.	Metal melted.	Crucible.	No. of heats to melt.	Time of each heat.	Coke consumed.
Natural draught	2,200 lbs.	No. 90	10	2 hrs.	1,980 lbs.
Blast	2,200 lbs.	No. 90	10	1.5 hr.	1,320 lbs.
Excelsior	2,200 lbs.	No. 90	10	1 hr.	396 lbs.

The firm of G. Terlinden & Co., of Oberhausen, make the following statement about the saving of melting charges by the use of the Excelsior furnace:—

Cost per lb. of brass castings, including melting, wages, molding and metal, using ordinary type of brass furnace	12.2c. lb.
Cost per lb. of same using Excelsior furnace	11.3c. lb.

This firm states that they manufacture a line of small brass work. Inasmuch as the castings are mostly small the metal must be hot. Their loss in using ordinary type of furnace is about 6 per cent. while that of the Excelsior furnace is but 4 per cent.

Two kinds of furnaces are manufactured: The one as shown in Fig. 1 is intended for large pieces of metal, while that shown in Fig. 2 is used for chips. The furnace consists of two parts: The top and bottom (or furnace proper). The crucible is placed on a bottom and coke packed around it. The top is put on by means of a crane (Fig. 3), and the hopper filled with the metal (after the crucible has been filled). An air blast is forced through the pipe A into the air chamber X. As the metal melts in the crucible the reserve amount g in the hopper has already become heated and falls down into the crucible. A cover h allows the metal to be inspected while melting is taking place. The stoppers S allow more fuel to be added during the melting if required and so avoid removing the whole top of the furnace.

The modification shown in Fig. 2 is practically the same as that of Fig. 1 except that an air space is required around the hopper-crucible. This is necessary, otherwise the chips would not allow the gases to pass through them. The air chamber in this type is around the furnace body, thereby becoming heated before being used. This modification uses a crucible for the hopper and is not quite so economical for large masses as the

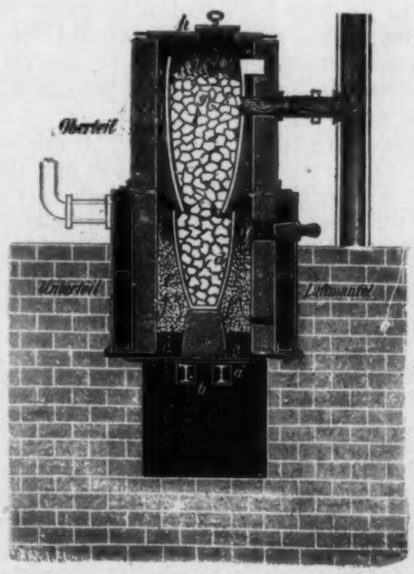


FIG. 2.

other, but may be used for all kinds of metal if desired.

In Fig. 3 is shown the crane for lifting off the top of the furnace when the melting operation is finshed. The crucible is then removed from the fire in the usual manner.

It is claimed that the crucibles last 30 per cent. longer than in the ordinary type of brass furnace.

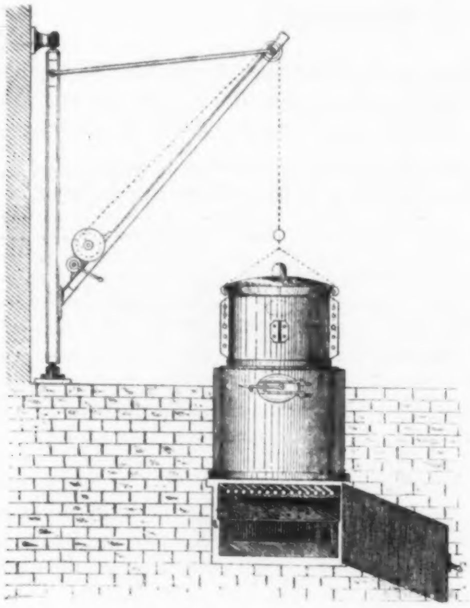


FIG. 3.

THE RELATIVE COST OF OIL AND COAL FOR FUEL

The use of oil for fuel is so alluring that its cost compared with that of coal is often overlooked. There are many cases, to be sure, where oil, even with its large increase of cost over that of coal, is a decided advantage, and in many instances work is accomplished by means of oil that cannot be done at all with coal, so that it is apparently quite unfair to cite such cases as having any relation. When it comes to the plain case of cost of fuel, regardless of any particular advantage or shape, then the balance is very much in favor of coal.

Prof. A. L. Williston has recently given the subject of oil fuel much attention and has arrived at the following conclusions, viz.: One ton buckwheat coal at $2.85 is equivalent to 3.6 barrels of fuel oil at $1.47 ($5.29). If, however, the matter of ash removal and firing together with the cost of steam and repairs for the oil burners is taken into consideration, the figures become $3.23 for the coal against $5.48 for the oil.

These figures are based, of course, on the price of coal and oil laid down in New York City, and the ratio between them will be changed as the conditions change. If we assume the conditions in the East with anthracite coal used for brass melting at $5.00 per ton and fuel oil at 4c. per gallon, then 1 ton of coal at $5.00 equals 3.6 barrels of oil at $1.88 or $6.76. In other words the ratio becomes 1 to 1.35 in favor of the coal.

RECOVERY OF NICKEL FROM SCRAP ANODES*

By A. K. Beckwith, Dowagiac, Mich.

While it is the usual practice to melt scrap nickel andoes in the crucible, our company fitted up a cupola for the purpose. As nickel is more infusible than iron naturally more coke is consumed and the charges must be made accordingly. We use a ratio of one to one for the bed, and two and one-half to one for the charges. The following is the result of one run which required two heats, the total amount of scrap melted being 875 pounds.

The scrap was worth $218.75, the coke used was 640 lbs., valued at $2.25, molder's time, $3.00, labor $2.00, or total cost $226.00. The yield was 635 pounds of nickel anodes, which at 50 cents a lb. made $317.50, then 75 lbs. scrap worth $18.78, making a profit on the operation of $110.25.

*Discussion at Convention of American Foundrymen, Milwaukee, June, 1903.

PURE NICKEL WIRE

By Erwin S. Sperry.

The ordinary nickel of commerce, while pure in the sense that this term is usually employed, will neither roll into sheet nor draw into wire. Both hot and cold it cracks to pieces if this operation is attempted. That pure nickel sheet and wire are articles of commerce is not generally known, but a German company have been making these articles for a considerable length of time and exporting to the United States. At present the use is somewhat limited, caused, no doubt, by the ignorance of the existence of such commodities, but it is believed that were the fact known that such material could be purchased a much larger demand might be produced.

The writer recently obtained some wire from this company and the following test was made of it. The wire was obtained in the annealed state and the test was made on it both in this condition and when heated and quenched in water:

ANNEALED (AS OBTAINED).

Diameter	0.071 in.
Broke at	294 lbs.
Tensile strength per square inch	74,200 lbs.
Elongation in fractured section	30 per cent.
Elongation in 8 in.	29 per cent.
Reduction of area	69 per cent.

ANNEALED AND QUENCHED IN WATER.

Diameter	0.071 in.
Broke at	292 lbs.
Tensile strength per square inch	73,700 lbs.
Elongation in fractured section	36 per cent.
Elongation in 8 in.	29 per cent.
Reduction of area	71 per cent.
Twists in 6 in.	102

The wire, after breaking, showed no slivers or scales.

GOLD-COLORED BRAZING SOLDER

The demand for a gold-colored brazing solder is not extensive, yet it is often desired to match the color of the parent metal. Some time ago a granulated solder of a good color was put on the market. The following analysis was made of it:

Copper	46.08	per cent.
Zinc	53.02	" "
Silver	1.01	" "
Lead	trace	" "

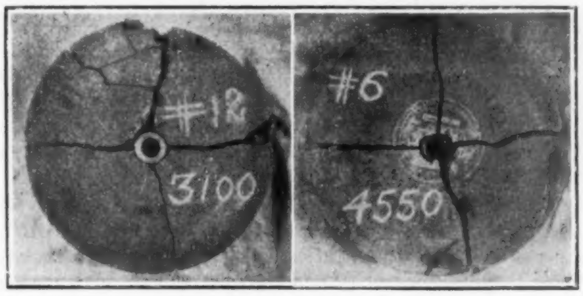
The solder is quite brittle, of course, and cannot be rolled into sheet or drawn into wire. It is generally used in the granulated form.

The use of platinum wire in the terminals of incandescent light globes has been partially responsible for the present price of this metal. There has, up to the present time, been nothing which would take its place. Other metals could be inserted in the glass while in a molten condition, but as soon as cooling took place the glass cracked from the difference of expansion of the metal and itself. Platinum and glass possess very nearly the same coefficient of expansion as glass, hence its use. All other metals which could be used expand differently. An alloy called "Planite" has recently been used to some extent, and there are reports that it will replace platinum for incandescent light work. The composition is said to be an alloy of iron and nickel.

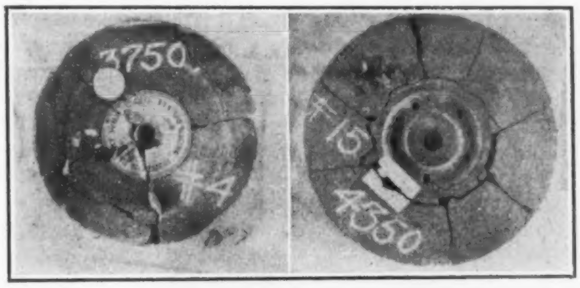
THE BURSTING OF EMERY WHEELS*

By Charles H. Benjamin, Cleveland, O.

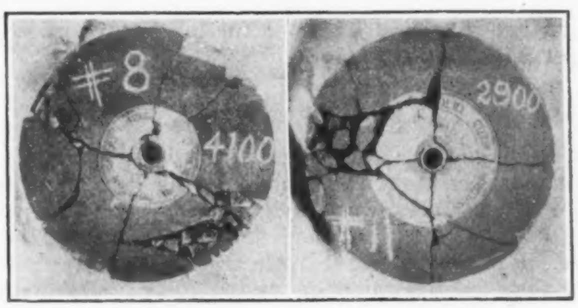
Several years ago the writer was consulted regarding some points of a case in litigation occasioned by the bursting of an emery wheel and the resulting death of the workman. The question to be decided was whether the accident was caused by the carelessness of the operator or whether the speed recommended by the makers was unsafe.



Most manufacturers of emery wheels test the wheel for their own information, but the results are not published. At the Norton Emery Wheel Works all wheels are tested at double the speed required in service, and occasionally wheels are burst to determine the actual factor of safety.



Emery wheel accidents can be usually traced to the carelessness of the operator. One common cause is allowing work to slip or roll in between the rest and wheel. The writer was present at an occasion of this kind and, although he was not in the plane of rotation, he has never forgotten the sensation.

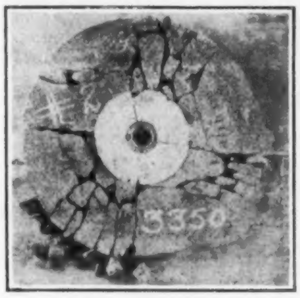


The wheels tested were all of the same size, sixteen inches in diameter and one inch thick. Six different makes were tested. The following table shows the results, viz:

*Abstract of paper presented at the Saratoga meeting American Association Mechanical Engineers, June, 1903.

TABLE.

No. of Test.	Grade Mark.	No. of Emery.	Working Speed.		Bursting Speed.		Speed Ratio.	Factor of Safety.	Remarks.
			Revs. per Minute.	Feet per Minute.	Revs. per Minute.	Feet per Minute.			
1	4.5	20	1,200	5,030	3,400	13,000	2.38	6.67	
2	4.5	20	1,200	5,030	3,200	13,400	2.67	7.14	
3	4.5	20	1,200	5,030	3,350	14,030	2.79	7.73	
4	Q	30	1,250	5,230	3,750	15,700	3.00	9.00	
5	Q	30	1,250	5,230	2,750	11,500	2.20	4.84	
6	H	30	1,400	5,870	4,550	19,050	3.25	10.56	Wire Netting.
7	H	30	1,400	5,870	4,600	19,200	3.28	10.76	
8	O	36	1,250	5,230	4,100	17,200	3.28	10.76	
9	O	35	1,250	5,230	4,125	17,250	3.30	10.89	
10	2.5	60	1,150	4,830	2,750	11,500	2.39	5.71	
11	2.5	60	1,150	4,830	2,900	12,100	2.52	6.35	
12	Mc H.	14	1,200	5,030	3,100	12,970	2.58	6.66	
13		24	1,200	5,030	3,800	15,900	3.17	10.00	
14	H	10-12	1,200	5,030	4,100	17,200	3.42	11.70	Vulcanized Rubber.
15	H	10-12	1,200	5,030	4,350	18,200	3.63	13.10	



Wheels Nos. 6 and 7 contained a layer of brass netting. Wheels Nos. 14 and 15 were so-called vulcanized wheels. These two varieties of wheels were considerably stronger than the others. Our illustrations show the characteristic fractures and the appearance of various wheels after bursting.

THE INTERNATIONAL NICKEL COMPANY.

The first annual report of the International Nickel Company shows a net income of $1,009,392, interest on bonded debt $450,244, surplus, $559,148. The report states that a careful examination of the various manufacturing plants has shown them to be in very bad condition, nearly all of the machinery being old and much of it obsolete. The company intends to re-construct the plants of the constituent companies, bringing them up to the highest standard of metallurgical and economic efficiency. The proposed improvements include a new smelting plant at the Canadian Copper Company's works in Canada, and when these improvements are completed the Orford Copper Company's works of New Jersey will be constructed on modern lines. The business prospects are stated to be better than for the year past, as the demand for nickel is increasing. The International Company comprises, the Canadian Copper Company, the Orford Copper Company, the American Nickel Works, the Nickel Corporation, Ltd., and the Societe Miniere Caledonienne.

Professor Charles A. Doremus of New York has been granted patent No. 725,683, for a process of obtaining alumina. The claim reads:

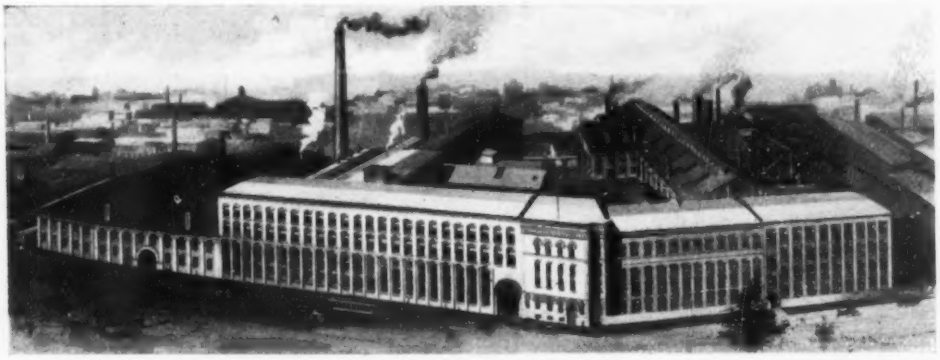
"The process of obtaining alumina by first reacting upon aluminous material, such as specified, with an acid containing fluorin, thereby producing aluminum fluorid, and then subjecting such fluorid to the action of superheated steam, substantially as described."

THE WATERBURY FARREL FOUNDRY.

Outside of the actual industry itself, no company is more closely identified with the brass and copper trade than the Waterbury Farrel Foundry, of Waterbury, Conn. Wherever copper, brass, aluminum, German silver, silver or gold are rolled products of this company are found. It would be difficult, indeed, to discover a mill manufacturing these products which did not have the majority of its equipment of Waterbury Farrel Foundry manufacture. It is a quite significant fact that nearly all the leading brass and copper rolling mills have almost a complete equipment made by this company from the casting shop furnaces to the slitting machines.

WATERBURY FARREL FOUNDRY IN 1851

The Waterbury Farrel Foundry was established in the year 1851 in the modest manner shown in the photograph. It began to make products which the consumer early realized were good and he came back a second time. Not only the excellence of its product but the ability possessed by its officers in keeping ahead of the times have been instrumental in bringing about the present culmination in growth. This company is never satisfied with leaving well enough alone but is continually striving to improve its old machines or evolve new ones.



WATERBURY FARREL FOUNDRY IN 1903.

One must not believe that the equipment of rolling mills is all that this company manufactures, for such is not the case. Presses of every description for working sheet metals, rivet machines, hydraulic machinery and presses, spinning lathes, cartridge machinery, draw benches, in fact everything for the working of metals from a pin machine up to an alligator shear capable of cutting a 4-in. cold steel billet. The U. S. Government too seems to realize the ability of this company, for the new mint at Philadelphia has been equipped with its machines.

Steel rolls are only used in small sizes for cold rolling metal, as in large sizes the difficulty in hardening the steel is very great. It is necessary that the surface of a roll shall be very hard in order to avoid being dented by the metal. Even the surface of a chilled roll is often dented by very hard rolled alloys, especially when rolled in narrow strips.

THE PRESENCE AND USE OF ARSENIC IN PICKLING ACID

There has always been a tendency in the metal industry to obtain pure materials, and if any obstacles were met the difficulty was supposed to have been caused by the impurities in the metals or substances used. While this is so in many instances, there are others where impurities appear to be necessary for the attainment of the best results.

Strange to say, the oil of vitriol (sulphuric acid) used in pickling wire has been found by A. Meurice* to work much more satisfactorily when arsenic is present to a considerable extent. All commercial sulphuric acid contains arsenic to a greater or less extent, but this investigator found that arsenic must be present to a considerable extent in order to obtain the best results. In testing two samples of acid, one of which was called bad and the other good, he found that in the good sample 0.5 per cent. of arsenic existed, while in the bad sample only 0.1 per cent. was found. In practice the sample of acid containing the larger amount of acid attacked the wire well and without effervescence, and gave a wire of even gauge without breaking in drawing. The opposite took place with the acid which contained the lesser amount of arsenic. He finds that the most satisfactory amount of arsenic which should exist in the solution is .007 per cent. in the bath solution. The bath for pickling, as used by the author, was composed of about 1 per cent. of acid and the rest water. He furthermore adds that the consumption of acid in pickling is reduced 50 per cent. by the presence of arsenic. The draw plate is likewise more lasting and the quality of the wire better. While these results are from experiments with iron wire, the matter has an important bearing upon the pickling of brass and copper wire.

FLUX "IRON FIEND"

Some time ago a flux called "iron fiend" was sold on the market for the purpose of removing iron from brass chips. It has been withdrawn from sale. Our experience with it, while indicating that it did not entirely remove the iron, was that it made a good ordinary flux for protecting the oxidation of melted metal. An analysis gave the following results, viz.: sea sand, 62 per cent, and soda ash, 38 per cent. These ingredients were apparently mixed together in proportions of about two parts of sand and one of soda ash. When melted the flux forms a viscous mass not too fluid for the purpose of skimming off. The flux sold for twelve cents per pound, and cost less than a cent to make.

*Bull. de l'Assoc. Belge Chimistes, 9, 343.

THE LIGHT ALUMINUM ALLOYS*

By Joseph W. Richards, Ph. D.

Pure aluminum is a comparatively soft and weak metal; it has many of the properties of copper. The pure metal hardens quickly while being worked, faster when worked cold, and becomes harder, more elastic and stronger, but soon goes to pieces if worked too far. The hard-drawn aluminum wire or hard-rolled aluminum sheet have strong physical resemblances to hard-drawn or hard-rolled copper. To produce thin sheet or fine wire it is necessary to anneal frequently, to remove the strains caused by the working. Castings of aluminum, unworked, are soft and weak.

For all purposes where the rolled, drawn, or worked pure metal is sufficiently hard and strong it is advisable to use the pure metal, since it resists alteration by the atmosphere and other corroding agencies better than almost any of its alloys and better the purer it is. For cast articles and wire, rod, or sheet which are not sufficiently strong or hard when made of the pure metal, the aluminum can be alloyed with small quantities of other metals, which improve it in various ways without materially increasing its specific gravity.

Alloying the Metals.—The best results are obtained with the purest metals. Commercial metals are often very impure and poor results are obtained in using them. This is particularly true of zinc, the ordinary Western brands of which contain 1 per cent. or more of lead and considerable iron.

As a general rule it is advisable to melt the aluminum first and then stir or dissolve the metal in it. Most metals unite with aluminum with considerable energy and readily dissolve in it, even if their melting point be considerably higher. For a metal, such as nickel, it is advisable to prepare an alloy in say equal proportions. This alloy is then added to the pure aluminum and dissolves much more readily than the pure nickel.

The melting can be performed in an ordinary graphite crucible. If the operation is the alloying, a covering of charcoal is needed, but if it is simply one of melting, no covering at all is required. It is of importance that the metal should not be overheated. The disadvantages of such overheating are, viz.: It absorbs gases, it will probably be poured too hot and segregate in the mold, it will react on the crucible, reduce the iron and silicon from it and become brittle. It is of the greatest importance that the alloy never be over a cherry red. A wrought iron stirring rod may be used, but, on account of the action of aluminum on it, it is better to use a carbon rod with an iron pipe for a handle.

When the alloy has been made, it should be poured at once. Letting it stand in the furnace sometimes produces a closer alloy, but the deterioration caused by the increased gases and impurities usually overbalances the gain. The alloy should be allowed to cool down before pouring. If cast too hot, it is apt to segregate in the mold while cooling.

The use of a flux in melting is not recommended as it attacks the crucible and thus introduces impurities into the alloy. The iron skimmers or ladles may be coated with a wash composed of finely ground bauxite mixed with a little lime. Magnesia lined crucibles are best for this work when they can be gotten.

Melting Points.—Almost all the light strong alloys melt easier than aluminum. The addition of a few per cent. of any metal, even though it has a high melting point, lowers the melting point of the alloy. Copper added up to 33 per cent. decreases the melting point, above which it rises. Antimony, however, is an exception. Small quantities increase the melting point considerably; 33 per cent. of antimony makes an alloy which melts at 230 degrees higher than aluminum and 250 degrees higher than antimony.

Specific Gravity.—The alloys with magnesium, 2 to 12 per cent., are the only ones which are lighter than aluminum. These alloys are lighter than we would expect. Thus, theoretically, 10 per cent. of magnesium would make a mixture which should have a specific gravity 0.16 less than aluminum whereas it is actually 0.24 lighter. This points to expansion taking place during alloying. In the case of the other metals the alloys are usually higher than the calculated amount pointing to a condensation or contraction taking place.

Molds.—For general castings, green sand is suitable. Large gates, heavy feeders, and numerous air vents are necessary. The alloys are poured as cold as possible to avoid segregation. To partly avoid this the castings are shaken loose from the sand and as soon as they are set. Slabs and rods for rolling or drawing are cast in chill molds, as the metal is soft, uniform and stronger than if cast in sand and the surface is smoother. Any objects needed in large quantities are likewise cast in chilled molds.

Rolling and Annealing.—As the alloys are hardened and stiffened by working they must be frequently annealed. The slabs or billets are best broken down under a steam hammer while warmed to 150° to 250° C.; afterwards steel rolls with good surfaces are used. Imperfections in the casting may be scraped or gouged out before breaking down. Slabs are usually rolled two passes lengthwise, increasing the length 20 per cent., and are then turned 90° and rolled out further. The rolls should be at 150° to 200° C., and if polished sheet is required, the sheet is polished before being put through the finishing rolls.

The annealing is done in a muffle, if possible, as it is not advisable to subject these alloys, especially Magnalium, to the direct action of the flame, since absorption of gas, internal oxidation and burning takes place at redness without melting. Slabs and bars are heated to a full dark red, so that a pine stick carbonizes when drawn over it.

Dipping and Frosting.—Alloys with magnesium or zinc can be given a pure white surface by dipping into a 10 per cent. caustic soda solution containing 2 per cent. of common salt and slightly warmed. After washing it is dipped into strong nitric acid, then rinsed and dried in sawdust. The dipping solution is recommended for rolled slabs after first annealing, as any casting defects may be seen and readily eradicated. By repeated dipping, a fine silky matte is obtained which is absolutely unalterable in the air.

Black Finish.—A dull black finish may be obtained by using India Black Varnish and keeping at 100° C. for one hour. A shining black can be obtained by using Black Stain Varnish and keeping 1 to 1½ hours at 50° C.

Chromium Alloys.—Chromium hardens aluminum strongly, the alloys having somewhat of the qualities of self-hardening steel, i.e., retaining their hardness on heating or after annealing much better than any other alloys. Two to three per cent. is recommended as making the metal much harder. Eleven per cent. makes a brittle alloy. Chromium alloys are being used commercially at present, but the writer cannot say to exactly what extent.

Titanium Alloys.—Alloys up to 7 per cent. of titanium have been produced, but are difficult to make. The

*Abstract of a paper read before the American Society for Testing Materials at Delaware Water Gap, July 3, 1903.

best alloy contains 2 per cent. of titanium. This has an elasticity comparable with spring brass, a tensile strength of 30,000 to 35,000 lbs. per square inch, with 3 per cent. elongation. When annealed the tensile strength is 21,000 lbs., with 16.5 per cent. elongation.

A triple alloy of aluminum, titanium and chromium is very hard and rigid and takes a cutting edge.

The titanium alloys have a dull color, easily corroded, and their use has practically disappeared.

MANGANESE ALLOYS.—The alloys up to 5 per cent. are hard and rigid. The manganese used should be produced in the electric furnace as a rich alloy of aluminum and manganese. Commercial ferro-manganese contains so much iron and carbon that a poor alloy is produced. Used with copper and nickel, manganese makes the hardest light alloy yet produced.

TIN ALLOYS.—An alloy of aluminum and 10 per cent. of tin has been strongly recommended as it is whiter than aluminum and more easily soldered. The alloy is said to be improved by the addition of 3 per cent. of nickel but as far as the writer is informed the use of these alloys has disappeared. Tin is still used in some alloys to contribute to easy fusibility and decrease shrinkage.

SILVER ALLOYS.—The silver alloys are harder, stronger and whiter than pure aluminum and take a higher polish, which they retain better than pure aluminum. These alloys, on account of their fine grain, have been used since the early days of aluminum. The alloy containing 3 per cent. of silver has been used for statuettes; the 5 per cent. for spoons, knives and springs; with 3 per cent. of silver and 2 per cent. of copper for balance beams and with 5 to 9 per cent. of silver and 1 per cent. of copper for cast dental plates.

NICKEL ALLOYS.—As far as the writer can find out, the alloys of aluminum with nickel have not been found advantageous. The commercial alloys which go under the name of "Nickel-Aluminum Alloys" are, in reality, ternary alloys of aluminum with nickel and copper. The alloys made for rolling contain from 2 to 5 per cent. of nickel and copper together; the larger part being usually copper. The plates of the yacht "Defender" were made from this alloy. What are called "Nickel Aluminum Casting Alloys" contain 7 to 10 per cent. of nickel and copper together. A sample of this alloy tested by the Bethlehem Steel Company, contained 3.5 per cent. of copper—*no nickel*—and had a tensile strength in casting of 15,000 lbs, per sq. inch.

TUNGSTEN ALLOYS.—The precise effects of tungsten alone has not been very satisfactorily determined. Mannesmann, in making aluminum tubing, found that tungsten made the metal stronger and increased its resistance to corrosion. Under the trade name of "Wolfram-Aluminum" an aluminum alloy containing a small amount of tungsten has been extensively used for military equipments, the sheets of metal made from the alloy rolling, drawing and spinning well without tearing or smearing the tools.

COPPER ALLOYS.—Copper is one of the most frequently used hardening agents for aluminum, being often used with other metals. In casting, these copper alloys are only slightly stronger than pure aluminum when cast in sand, and to obtain high tensile strength they must be cast in chills. Aluminum alloyed with 2 or 3 per cent. of German silver gives a strong, tough alloy and is easily made.

MAGNESIUM ALLOYS.—These alloys have been patented by L. Mach and cost more than pure aluminum. The Magnalium Gesellschaft of Berlin, Germany, states that 61,000 lbs. per sq. in. may be obtained in chill castings. Cast in sand, the same alloy gives 21,400 lbs. per square inch. This alloy contained 10 per cent. of magnesium. The use of these alloys is said to be increasing in Europe, but no report about their durability is yet at hand.

ZINC ALLOYS.—Zinc is the cheapest, and, at the same time, one of the most efficient metals which improves the mechanical qualities of aluminum. Up to 15 per cent. the alloys are malleable, and in castings up to 33 per cent. may be used. Casting in chills gives much better results than in sand.

The alloys may be made by melting aluminum and adding zinc thereto. The alloying readily takes place. The 15 per cent. alloy can be rolled and drawn. The 25 per cent. alloy, cast in sand, has a tensile strength of 22,000 lbs. with 1 per cent. elongation. When cast in chill molds it has a tensile strength of 35,000 to 45,000 lbs. per sq. in. This alloy bids fair to become the most generally useful of all the light aluminum alloys.

The 33 per cent. alloy, sometimes called "Sibley Casting Alloy," is extremey rigid, with a fine grained fracture. It is not so resistant to shock as the alloys containing less zinc. Its tensile strength in sand castings is 24,000 lbs. up to 40,000 lbs. in chill molds, with no perceptible reduction of area. It works well and requires no lubrication. The large proportion of zinc makes it the cheapest of all the alloys.

Several casting alloys have been made containing both zinc and copper. An alloy of aluminum with 5 per cent. of copper and 15 per cent. of zinc, and as high as 27 per cent. of zinc and 3 per cent. of copper, has been used commercially for some time. A commercial alloy for making hard, strong and sharp castings consists of 15 per cent. of zinc, 2 per cent. of tin, 2 per cent. of copper and 0.5 per cent. each of manganese and iron.

THE PROPER MIXTURE FOR YELLOW BRASS SAND CASTINGS.

There appears to be a notion that one mixture of yellow brass is as good as another for casting in sand, but such is not the case. There is, of course, a desire to put in as much spelter as possible and oftentimes all the mixture will stand is introduced and the foundryman then wonders why he obtains such dirty castings. Yellow brass, of course, with spelter up to 40 per cent. is good material as regards strength, but it contains so much of this metal and gives off so much smoke that the castings are invariably more or less dirty. A small amount of aluminum, of course, obviates this difficulty, but is open to some objections, especially if the work is required to stand pressure.

It has been found that, if good clean yellow brass sand castings are desired, the brass should not contain over 30 per cent. of spelter. This will insure an alloy of good color and one which will run free and clean. Tin or lead may be added as desired, but do not effect the quality of casting clean.

The following makes a good casting mixture and one which will cut free and is strong:

Copper	7 lbs.
Spelter	3 lbs.
Tin	4 oz.
Lead	3 oz.

If the mixture is desired to be stronger, more tin may be added, but this amount is usually sufficient. If too hard, reduce the amount of tin. The usual yellow brass sheet or chips found on the market as scrap will, when melted, waste about enough spelter to bring the amount down to the above amount.

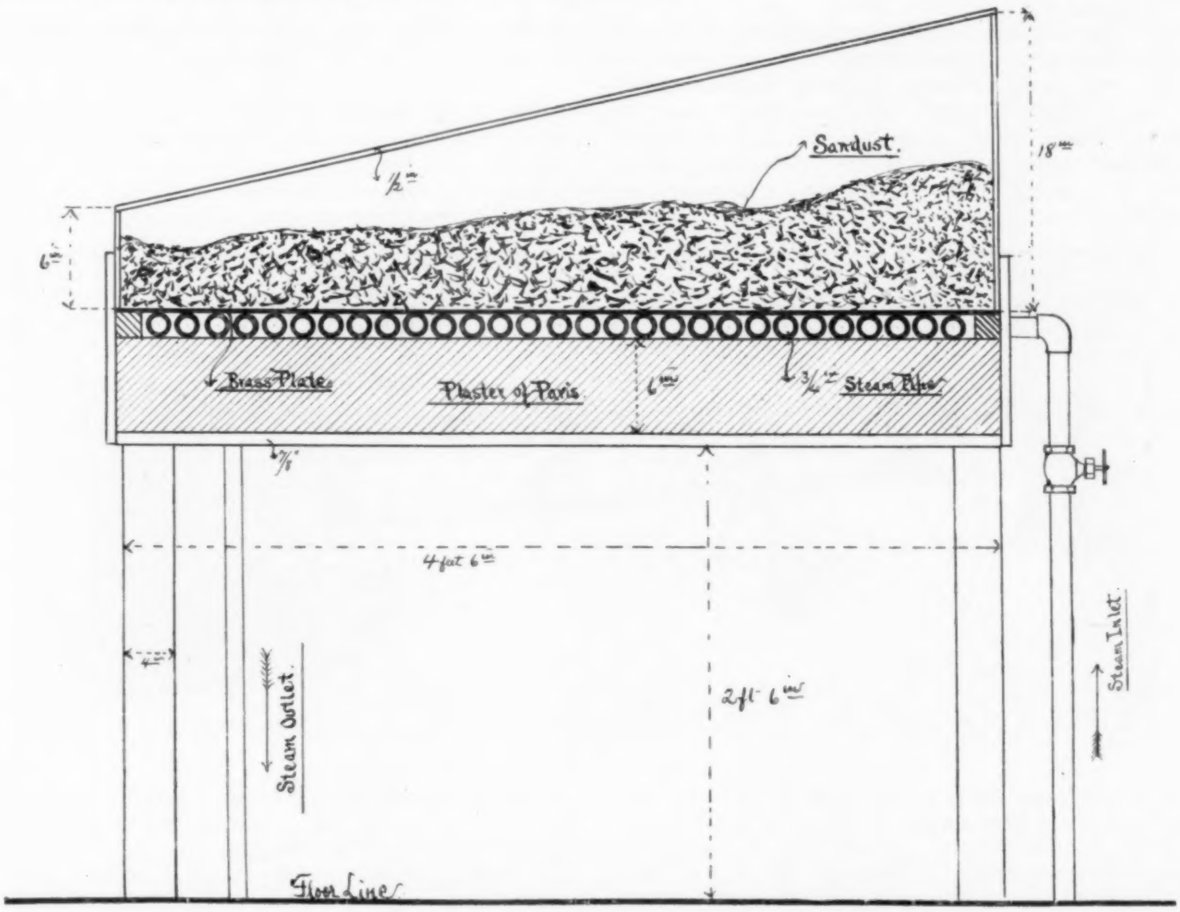
DRYERS AND DRYING OUT

By F. P. Davis, Florence, Mass.

In a dryer, the best results are obtained from substances which give off the most heat per square foot of surface, and in building a dryer care should be taken to confine the heating pipes in such a manner that all the heat must necessarily pass up through the sawdust used to absorb the rinsing water adhering to the work.

Dryers are frequently made with simply a sheet of thin iron beneath the heating pipes and, it is safe to say, that more heat radiates through this than through the sawdust box. A better way is to make a box four and a half feet wide and four or eight feet long, according to the capacity required; the eight foot box to be subdivided for reasons explained later. The box should be about six inches deep. After all the cracks have been puttied up, the inside should be painted or shellacked in order to render it watertight. After this has been done plaster of paris, of sufficient thinness to flow out readily, is poured into the box to a thickness of two inches. Now lay in the steam coil of three-quarter inch steam pipe back and forth as closely as possible. The entrance hole should be through the end of the box just above the plaster of paris and, after all connections have been made, should be made tight with more plaster. Next, nail an inch square strip around the inside of the box, the box to be just level with the top of the steam coil. The cover over the steam coil should be of sheet brass of about No. 24 Stubbs gauge in thickness. Nothing else is as satisfactory, although zinc of a heavier gauge, say No. 22, may be used, and is, of course, much cheaper. The heat will in time, however, cause the zinc to "drop-in" around the steam pipes and produce an uneven bottom, which renders it difficult to gather up small work, such as nails, etc. Sheet iron, either plain or galvanized should not be used where the best results are required, as the rust which will invariably form discolors the work.

The second box, about six inches deep in front and about eighteen inches deep at the back, is now made. This box should be made without a bottom, and so as to fit tightly inside of the other. The material from which the first box is made should be a full inch in thickness, but half-inch stuff will do for the inner box. An end sectional view will have the appearance of the following drawing:



END VIEW OF DRYING TABLE.

If considered desirable, the brass sheet may be screwed down to the cleat around the inside of the box, and such a procedure will effectually prevent the sawdust from coming in contact with the heating pipes and obviate any possibility of combustion. This dryer may be readily taken apart for repairs, and its construction admits of its being put together again without injury.

The plaster of paris which is used in the under side of this dryer is a poor conductor of heat, and if live steam of the ordinary boiler pressure is employed, the underside of the dryer will be no more than warm. All the heat must pass up through the sawdust, where it is required. The dryer fully meets all requirements of the insurance companies, and its advantages are apparent. The size, two and one-half by four feet, is a very practical one, all things considered, and is adapted for a variety of different sized work. A partition may run through the eight foot size, where room enough for two workmen

is required and is more practical than two single dryers of the same dimensions.

Too little attention is usually given to the sawdust that is used for drying out; in many places anything that is sawdust is considered good enough. Some persons, who have used many kinds, believe that white birch is the best for all-around purposes, with the exception, of course, of boxwood, the cost of which prohibits its use except where especially fine work is required. Seasoned white birch sawdust is entirely free from any form of gummy or resinous matter, and if a medium fine grade is used it will absorb more water, dry out more quickly, and last longer than any kind the writer, in his seventeen years of experience, has used. It has the particular advantage of not clinging to the work after it has been wet and dried once or twice.

For brass work after acid dipping, nickeled work to be buffed, and the coarser grades of plated work, whitewood sawdust is very good indeed; it is cheap and may be obtained from manufacturers of low-priced furniture. Whitewood works well in the dryer, absorbs a good amount of water and does not cling to the work. Whitewood has a greenish color and poplar or basswood are nearly as good.

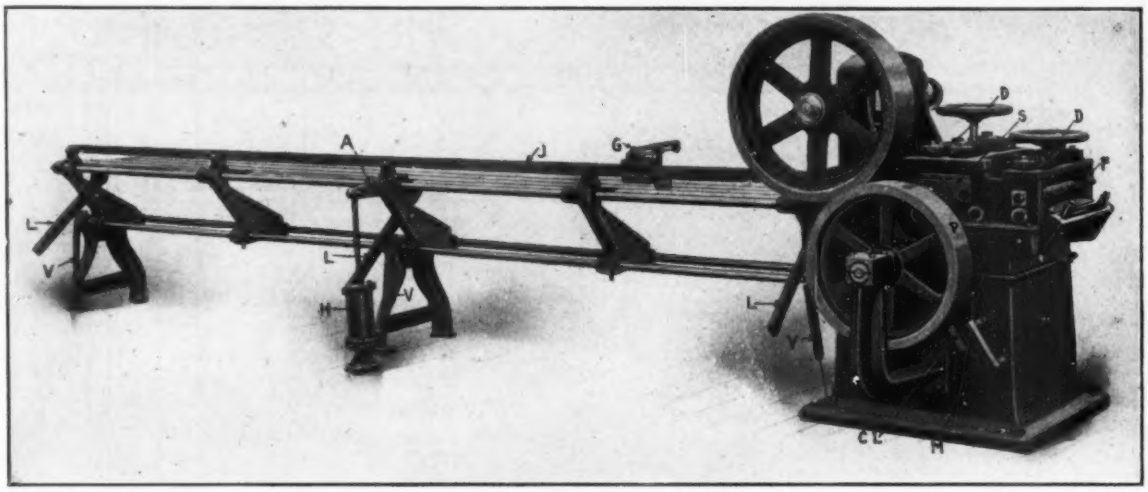
Ordinary sawdust from green logs is not the best. Piled in heaps in a green state it is apt to heat and become "punky" and "dead," and so lose its absorbing qualities, and, accordingly, lasts but a short time in a dryer. Sawdust made from the seasoned lumber of some manufacturer of wood products is the best, as it is sure to be well seasoned.

"Gray" or "white" nickeled work, as it is variously designated; that is work that is acid dipped or polished by attrition in a tumbling barrel, and plated to be used with no further finish, requires much care in drying to retain its clear, light color. The essential point in such a process is often overlooked. The work should be taken from the *cold* rinsing water directly to the dryer, and in no case should hot water be used. The latter will invariably darken the work and turn it yellow. The dryer must be hot and the work stirred about and agitated until dry, and then immediately removed, as any unnecessary heating will cause discoloration. Two pieces of pine or other soft wood, one-half an inch thick and about four by six inches, with the edges rounded, are quite convenient to stir about such small work.

Small brass plated articles and goods that are coppered merely to give color, and that are to be lacquered with no further finish after plating, should always be dried without the use of hot water. The drying of plated work which is to be buffed after plating will be greatly facilitated by rinsing a few seconds in hot, soapy water, sufficient to cause the water to "break" from the surface, and then passing through clean, hot water. The latter operation is essential, or the sawdust will become contaminated with soap which will cause spotted work. The first water should contain but little soap, just enough to make suds if agitated. The brilliancy of articles which have been plated with just enough silver to whiten them will be greatly increased if this process is used. The results will be surprising to those who have not used it. It is the little matters of detail, "tricks of the trade," that are worthy of attention. They help towards perfect work and are the result of observation and experience.

A NEW SHEET METAL STRAIGHTENING AND CUTTING MACHINE.

The F. B. Shuster Company, of New Haven, Conn., whose machines for straightening wire and automatically cutting it to length are used in every wire mill in this country, has recently evolved a machine along the same lines for straightening sheet metal and, at the same time, cutting it to length. This is a machine that has long been needed as the call, among rolling-mills, for sheet metal cut to accurate lengths is constantly increasing. The cutting of thin narrow stock has been heretofore a matter involving hand labor and with the consequent accompanying cost, so that the consumer has oftentimes been forced to take the sheet and cut it himself rather than stand the extra expense. With the machine, however, sheet can be cut with very slight cost, so that a customer who wishes sheet metal cut to length and straightened can obtain it from a rolling-mill possessing one of these machines without the usual expense. We predict, however, that the customer will eventually install one himself and be able to straighten and cut his own sheet.



A NEW SHEET METAL STRAIGHTENER.

The straightener shown in the cut will take sheet up to 14 inches wide and $\frac{1}{8}$-inch thick. The workings of this machine are fully described in a circular sent by the F. B. Shuster Company, who will be pleased to send it to those who are interested.

A metal anode has recently been patented and assigned to the Hanson and Van Winkle Company, Newark, N. J. The anode is a radical departure from the ordinary type, as it has an elliptical cross-section, and gives a more uniform and evenly deposited coating.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—An aluminum founder wishes to know what will remove the discoloration or coppery cast from aluminum castings which have been poured "hot."

A.—First dip in a potash solution, rinse and then pickle in a hydrofluoric (not hydrochloric acid). Wash well after this treatment.

Q.—Silver manufacturer asks whether a little silver solder mixed with scrap in melting will act injuriously and what will remove it.

A.—Silver solder contains zinc, which is apt to make the silver a little dirty. In small amounts, however, the effect is not noticeable. The zinc does not appear to affect the rolling quality. There is nothing which will remove it without refining.

Q.—A plater asks how oxide of gold is made and whether it will dissolve in cyanide bath the same as the chloride.

A.—Oxide of gold is best made by precipitating chloride of gold by means of magnesia, filtering, washing with dilute nitric acid to remove the excess of magnesia, and lastly with water to remove the nitric acid. The oxide of gold will dissolve in hot cyanide of potash solution.

Q.—A manufacturer wishes to know the method of producing a blue color on polished steel articles used for ornamental purposes.

A.—This color is given to heating the article in a specially constructed furnace. The steel must be hard and polished to a mirror finish before the operation is commenced as the bluing is nothing but a superficial oxidation. If a high polish is not produced on the article the color will not be good.

The furnace used for this work is called a *Coloring Furnace*, and is heated by gas. The American Gas Furnace Co., are the makers of such a furnace.

Q.—We have been asked about the value of an alloy of lead and aluminum and its method of manufacture.

A.—Lead and aluminum do not mix, or alloy except in very small amounts. If equal parts of lead and aluminum are melted, and, after being thoroughly stirred, poured into a mold, there will be found, after the mass has cooled, a casting consisting of two layers. The top will consist of aluminum, and the bottom of lead. The lead will contain a small amount of aluminum, and the aluminum a small amount of lead. Aluminum will absorb, under these conditons, about two per cent. of lead, but the latter imparts to the aluminum no useful qualities.

Q.—Subscriber wishes to know about casting metal in plaster molds. Also in regard to the use of bronze for dies.

A.—Metals have been cast in plaster of paris mold for a long time, but plaster of paris itself does not work well. In the Smith process, which we believe is owned by the Gorham Mfg. Co., of Providence, R. I., a mixture of plaster of paris and very finely divided asbestos is used. The two are mixed, and the mold made in the usual manner. After drying the metal is forced in the mold under pressure. The asbestos mixed with the plaster prevents it from cracking.

The metal dies are made of a 11 per cent. aluminum bronze, which has the advantage of being hard, and the sand does not adhere to it in casting. Of course the better the molding the less after work, as the die must be finished after cast. Aluminum bronze dies have proved to be excellent and are used to a large extent. The Gorham Co. have used them for some time.

Q.—An Austrian subscriber wishes to know whether valves are manufactured from aluminum in the United States. If they are, he would like to know the composition, and says that they have been tried in his country but have been found useless.

A.—Valves have been made in this country from aluminum and may be obtained at the present time, but no one carries them in stock. Our experience with aluminum valves has not been satisfactory, for the reason that it is quite difficult to obtain castings which will not leak under pressure. If it is desired to cast them, an alloy of 94 parts of aluminum and 6 parts of copper form the best mixture. This may be readily cast in sand. We believe that if a casting could be made that would resist pressure that aluminum valves might find certain legitimate uses. Pure aluminum is too soft to be used for casting purposes, and should always be hardened, preferably with copper.

Q.—A maker of marine goods wishes to know an aluminum mixture for electrical work and for marine deadlights.

A.—An alloy of 3 parts of aluminum and 1 part of zinc form an excellent mixture, although great care is required in casting it. It is cheap, tools well, and is strong. If difficulty is found in casting this mixture, an alloy of 94 per cent. of aluminum and 6 per cent. of copper should be used, which casts well, but is not as strong as the other mixture.

THE ALUMINUM ASSOCIATION CONVENTION.

Arrangements have been made for holding the third annual convention of the American Aluminum Association at the Murray Hill Hotel, New York, Wednesday and Thursday, September 2d and 3d. The plans for the first day are a business session from 10 A. M. until noon. In the afternoon there will be an excursion to Glen Island, where a shore dinner will be served. Thursday morning there is to be a business session, and the afternoon will be devoted to an excursion to Coney Island, and a dinner at one of the beaches. Everyone interested in the aluminum industry is invited to attend the meetings of the association, and it is hoped that there will be a full attendance of members and those interested.

ELIPHALET W. BLISS.

Eliphalet W. Bliss, the founder of the large power press works of the E. W. Bliss Company, Brooklyn, N. Y., died suddenly at his country home, Owl's Head, Bay Ridge, Long Island, on July 21st. Mr. Bliss was well known among manufacturers by his machinery and inventions. His inventions relate principally to the manufacture of presses and dies. He was also the sole manufacturer of the Whitehead torpedo, used by the United States Government, and was the owner of the United States Projectile Company, of Brooklyn. Mr. Bliss was born in Cooperstown, N. Y., in 1836. In 1857 he was engaged as a journeyman, at $1.60 per day, by Charles Parker, of Meriden, Conn. In 1861 he enlisted in the Third Connecticut Regiment, and served through the Civil War, being mustered out of the service as corporal. At the close of the war he moved to Brooklyn, and began the manufacture of power and foot presses.

TRADE NEWS

The Norton Emery Wheel Company are about to make extensive improvements to their Niagara Falls plant.

The Scranton Whetstone and Abrasive Wheel Company, of Scranton, Pa., will erect a $50,000 plant for the manufacture of emery wheels from Canadian corundum.

The Birmingham Iron Foundry, Derby, Conn., manufacturers of rolls and rolling mill machinery, are building a new roll room 75 x 165 feet. Two new travelling cranes, as well as heavy machinery, will be installed.

The Bates Metal Company, of Birmingham, Ala., have increased their capital stock to $50,000, and are now able to take care of their greatly increased business. Two new brass melting furnaces were recently put in.

The Eddy Valve Co., of Waterford, N. Y., are building a new foundry. An electric crane of 67 feet span, electric plant, and a complete compressed air equipment for pneumatic hammers, etc., will be installed.

The S. Obermayer Company, of Cincinnati, Ohio, have been awarded the contract for the foundry equipment of the technical school of the University of Chicago. Also for the Crane technical school, in the same city. The foundry supplies will be for melting both brass and iron.

The W. H. Sweeney Manufacturing Company, makers of tin, brass, copper and nickel plated ware, are adding another story to their factory located at 66 Water street, Brooklyn, N. Y. The additional floor is expected to be ready for occupancy the last of August.

Henry D. Pridmore, Nineteenth and Rockwell Aves., Chicago, Ill., has recently issued a very handsome catalogue of the molding machines which he manufactures. All the Pridmore machines are hand-rammed, as experience has demonstrated that this is the most satisfactory method.

The J. W. Paxson Company, of Philadelphia, report that their sales in brass furnaces for the last six months have been greater than any like period for several years. The number of orders that the company are continually receiving for brass foundry equipment indicates the general prosperity of the brass foundries.

The Michigan Brass and Iron Works at Springwells, Mich., has been purchased by C. W. Thomas, of the Roe Stephens Mfg. Company, of Detroit. The price paid for the property, $331,000, indicates the extent of the plant. Iron and brass foundries, machine shops and brass finishing shops are included.

The Colonial Refining Company, of 934 North Third street, Philadelphia, have built a new plant with increased capacity and a railroad siding. Since the establishment of this company in the year 1900, they have handled the ashes of all of the brass foundries in Philadelphia, and are now seeking the ashes of the out of town brass foundries accumulating carload lots.

The Glacier Metal Company, owing to their increasing Southern trade, have opened an office in Richmond, Va.

The Millet Core Oven Company, of Brightwood, Mass., state that over 1,000 ore ovens of their make are now in use.

Eldridge & Company, of Taunton, Mass., manufacturers of coffin trimmings, have not yet decided whether they will rebuild their recently burned plant, or locate elsewhere.

The Wire Novelty Company, manufacturers of all kinds of wire goods, as well as brass goods and hardware, have moved from New Haven to West Haven, Conn., where they will have better facilities.

The Tabor Manufacturing Company, manufacturers of the Tabor molding machine, have arranged with the Draper Machine Company, of Hopedale, Mass., to manufacture and sell the hand-rammed molding machine, which the latter have made for their own use.

The Waltham Emery Wheel Company, of Waltham, Mass., having contemplated moving to Worcester, Mass., for some time, have finally purchased a tract of land, and will erect a building there. The Waltham plant will be abandoned when the new building is ready.

The Pittsburgh Valve and Fittings Company, of Pittsburgh, Pa., have recently started a factory at Barberton, O., where an extensive line of brass, steam and water goods, as well as iron, will be made. A new catalogue has recently been issued by this company.

The Barlow Manufacturing Company, of Holyoke, Mass., manufacturers of store display fixtures, show cases and other metal goods, have recently increased their facilities for manufacturing goods. They now have their own brass foundry.

The Wright Wire Company, of Worcester, Mass., have taken part of the plant formerly occupied by the American Screw Company, and will begin the manufacture of architectural brass and iron work, such as bank railings and elevator enclosures.

Milwaukee is having its full share of labor trouble. Twenty-four hundred men employed in the brass working trade in that city have been trying for some time to bring their employers up to the compliance with their demands, but thus far no agreement has been reached. The situation has become quite serious.

The Massachusetts Saw Works, Springfield, Mass., manufacturers of hack saw blades and frames, have opened a New York office at 56 Reade St., with A. Z. Boyd as representative. This company is now putting up their saw blades in very attractive cabinets, and the latter, usually sold for $5.00, are furnished free of charge to dealers who carry their blades in stock.

TRADE NEWS

The New York Insulated Wire Company, of Wallingford, Conn., manufacturers of tinned and covered copper wire, are increasing the capacity of their already large plant by an extensive addition.

The New Jersey Wire Cloth Company, of Trenton, N. J., who are connected with John A. Roebling Sons' Company, have decided to build a large plant for the manufacture of Fourdrinier cloth.

The Chicago Flexible Shaft Company of Chicago, Ill., makers of the Stewart Gas Blast Furnace, are offering to send out any one of their furnaces on trial if so desired. They make over 55 different styles and sizes.

The sprue saw sold by the Brass Founders' Supply Company, of Newark, N. J., can be used as a band sprue saw for cutting sheet metal as well as for sawing off the sprues of castings. The saw is sent on approval.

William Durst, a manufacturer of brass goods at 4 Water street, Brooklyn, N. Y., has taken another floor at this location, giving him 10,000 additional square feet of space. He now occupies the whole building.

The Wolfe and Englert Composite Metal Company, of Catasauqua, Pa., expect to have their new $10,000 plant in operation by the last of August. They manufacture pump rods, valve seats, pump plungers, car journal bearings and castings for electric supplies.

The interests of John Hutsen, of the Standard Bronze Company, of Pittsburg, Pa., have been bought by L. W. Jones, who is now operating the plant with W. A. Cochran. The foundry's castings are mainly for mill work.

The Keystone Brass and Foundry Company, of Titusville, Pa., are now putting on the market a new form of machine for the transmission of power. This machine is the invention of L. D. Fulton, of the Germania Refining Works, and J. N. Fulton, of the Snow Pump Company.

At a meeting of the Brass Manufacturers of the United States, held in New York, on June 16th, it was decided to issue an official catalogue of everything in the line of water and brass goods. This catalogue will include much material heretofore not listed and charged for at random prices. This latter especially applies to ornamental work which have become staple goods.

The Dings Electro-Magnetic Separator Company, of Milwaukee, Wis., report recent orders for their metal separators from the Waterbury Manufacturing Company, of Waterbury, Conn.; Waterbury Clock Company, Waterbury, Conn.; Crane Company, Chicago; R. Williamson & Son, Chicago; Standard Brass Casting Company, San Francisco; Fort Wayne Smelting and Refining Works, Fort Wayne, Ind.; Adams & Westlake Company, Philadelphia; Northern Electric Company, Madison, Wis.; Simmons Manufacturing Company, Kenosha, Wis.; Dean Bros. Steam Pump Company, Indianapolis, Ind.

We have received an inquiry for aluminum hones, which are said to be well adapted for sharpening knives. Any manufacturer making them please advise THE METAL INDUSTRY.

The Aluminum Cooking Utensil Company, of Pittsburgh, is issuing a salesman's bulletin which tells canvassers how to sell aluminum ware.

C. T. Christie & Co., dealers in aluminum goods at Montreal, write that the aluminum business is rather slow in that city, but they look forward to a boom.

The Kalamazoo Railway Supply Company, Kalamazoo, Mich., have already moved into their new plant. The plant consists of five separate buildings, and gives perfect facilities for turning out work.

Factory D of the International Silver Company, at Lyons, N. Y. (formerly the Manhattan Silver Plate Company) has resumed operations, and are working on a complete set of new patterns.

We have received from the Pittsburgh Aluminum Company, of Los Angeles, Cal., a photo of the interior of their large Los Angeles store, which shows a finely equipped emporium of aluminum goods. A complete line of aluminum goods is kept in stock.

The Spence Manufacturing Company, of Milwaukee, Wis., announce that they are open for orders for specialty work in the brass line. This company is fully equipped for almost any kind of a job, and particularly for plumbers' supplies.

A recent use of aluminum devised by Janney, Steinmetz & Co., of Philadelphia, consists of a specially prepared wire for utilization in dye house practice. The yarn and warp supports made of this wire are said to be unaffected by the moisture and acid fumes of the dye house.

The Syracuse Smelting Works have given up their plant at 94 Gold street, New York, and will in the future make their headquarters at Montreal, Canada. Their New York business will be taken care of by N. London, at 101 Beekman street. The company are building a smelting works at Seattle, Wash.

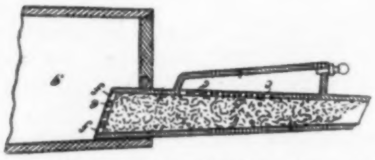
THE BRITISH ALUMINUM COMPANY.

The British Aluminum Company recently held their annual meeting. The profits for the year amount to £20,770, which is insufficient to meet the debenture interest, depreciation on plant, etc., so consequently the debit balance has been increased by £3,392 to £22,357. The debenture holders have agreed to postpone payment of interest due in November, 1902, to May, 1903. The £10,000 authorized to be raised in priority to the debentures last January was borrowed and £2,000 of it has since been repaid. It was stated at the meeting that the sale of aluminum has increased so satisfactorily that the Board have decided to extend the water-power installation at Foyers by erecting two new dynamos and to increase the capacity of the output of the several works of the company. It was also stated that considerable reduction in the cost of the manufacture of calcium carbide had been effected.—*The Electro-Chemist and Metallurgist.*

WANTED—BACK NUMBERS OF THE METAL INDUSTRY. We will extend the subscription of any of our readers for three months who will send us copies of the FEBRUARY, MARCH AND APRIL numbers of THE METAL INDUSTRY.

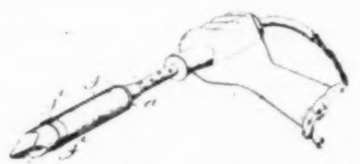
PATENTS

731,184, June 16, 1903. PROCESS OF OBTAINING ZINC.—Evan H. Hopkins, London, England.



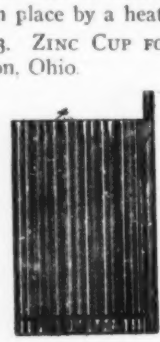
The process of reducing and collecting zinc which consists in subjecting a material containing zinc to heat in the presence of a reducing agent, excluding air and the heating flame therefrom and in conveying the zinc vapors into and condensing all of them in a mass of heated carbon from which air is excluded.

731,838, June 23, 1903. ELECTRIC SOLDERING-IRON.—James I. Ayer, Malden, Mass., assignor to Simplex Electric Heating Company, Boston, Mass.



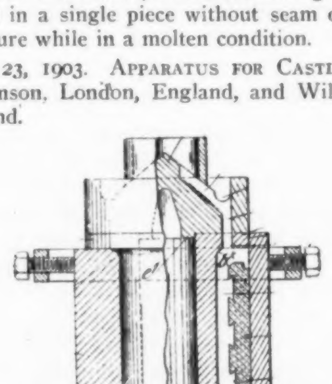
A soldering-iron, comprising an electric heat generator, a soldering tip, means for conveying the heat from said generator to said tip and a casing electrically insulated from the heat generator and inclosing said electric heat generator out of contact therewith and secured in place by a heat insulation joint.

731,422, June 23, 1903. ZINC CUP FOR PRIMARY BATTERIES.—Vincent G. Apple, Dayton, Ohio.



As an article of manufacture, a zinc containing-cup for primary batteries formed in a single piece without seam or joint, of zinc cast under pressure while in a molten condition.

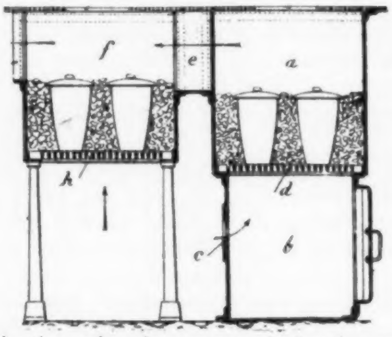
731,632, June 23, 1903. APPARATUS FOR CASTING BEARINGS.—William H. Tomson, London, England, and William G. Hanna, Glasgow, Scotland.



In apparatus for casting or lining by casting the bodies of brasses or bushes for bearings, the combination of a flanged cylindrical central part having a diameter equal to that of the shaft or axle with which the brushes are to be used, distance pieces of triangular section arranged at intervals in equidistant positions around the cylindrical central part and shaped to closely fit the face and flanges thereof, backing plates closing said spaces and means for removably holding the filling pieces and backing plates in position.

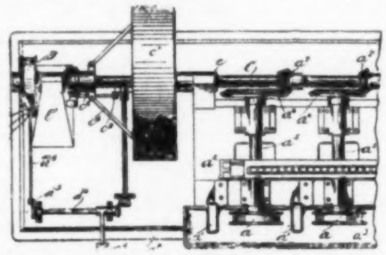
732,410. June 30, 1903. MANUFACTURE OF SILICON AND ALUMINUM FROM SILICATES OF ALUMINA. Christian H. Homan, Christiania, Norway.—The method of treating materials containing silicates of alumina, such as common clay, for the purpose of obtaining silicon and a slag containing aluminum oxid consisting in mixing the material with metallic aluminum in pulverized form exposing the mixture to a high temperature in an electric or other furnace, thereby reducing the silicic acid wholly or partly and also reducing other reducible bases and finally tapping off the resulting products separately.

731,555, June 23, 1903. DOUBLE FURNACE.—Albert Emy, Paris, France.



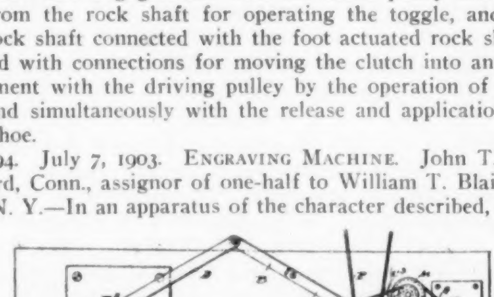
The combination of a furnace, an inclosed space below said furnace, and means for admitting air under pressure to said inclosed space, with a second furnace open on its under side, a pipe connecting the gas space of the first furnace with the second furnace and a flue leading from the second furnace to the chimney.

732,370. June 30, 1903. STOP MECHANISM FOR WIRE-DRAWING MACHINES. John H. O'Donnell, Waterbury, Conn., assignor to the Waterbury Machine Company, Waterbury, Conn., a Corporation of Connecticut.—The combination with a power shaft of a



driving pulley and a brake pulley carried thereby, a clutch applied to the driving pulley for operatively connecting and disconnecting the same from the shaft, and a vertically-moving brake-shoe for engaging the brake pulley and means for operating the said clutch and brake shoe simultaneously, said means comprising a foot-lever, a rock-shaft controlled thereby, a toggle for raising the brake shoe into engagements with the brake pulley and connections from the rock shaft for operating the toggle, and a separate rock shaft connected with the foot actuated rock shaft and provided with connections for moving the clutch into and out of engagement with the driving pulley by the operation of the foot lever and simultaneously with the release and application of the brake shoe.

732,694. July 7, 1903. ENGRAVING MACHINE. John T. Austin, Hartford, Conn., assignor of one-half to William T. Blaine, New York, N. Y.—In an apparatus of the character described, a panto-



graph, a frame reinforcing the same, a hollow sleeve-like pivotal connection for a joint thereof, a shaft therein and a pulley mounted on said shaft and longitudinally movable.

Metal Prices, August 3, 1903

METALS

TIN—Duty Free. Price per lb.

Straits of Malaca 28.75

COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.

Lake 13.25
Electrolytic 13.12½
Casting 12.75

SPELTER—Duty 1c. per lb.

Western 5.80

LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.

Pig Lead 4.15

ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.

Small lots 37.00
100 lb. lots 35.00
1,000 lb. lots 34.00
Ton lots 33.00

ANTIMONY—Duty ¾c. per lb.

Cooksons 7.37½
Hallets 6.75
Other 6.40

NICKEL—Duty 6c. per lb.

Large lots .... 40 to 50
Small lots .... 50 to 60

BISMUTH—Duty Free .... $1.50 to $2.00

PHOSPHORUS—Duty 18c. per lb.

Large lots 45
Small lots .... 65 to 75

Price per oz.

SILVER—Duty Free—Commercial Bars $0.54¾
PLATINUM—Duty Free 19.00
GOLD—Duty Free 20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask .. 47.50

Sheet Lead, 7¾c. per lb., 20 per cent. off.
Lead Pipe, 6¾c. per lb., 20 per cent. off.
Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 7.50c. per lb., open, 8c. per lb.
Tobin Bronze—Rods, Unfinished, 19c.
Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots .... 16½c.
Phosphor Bronze, Ingots .... 15 to 18c.
Silicon-Copper, Ingots .... 34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.50c.	12.50c.
Copper Wire	10.75c.	11.75c.
Light Copper	10.00c.	10.75c.
Heavy Mach. Comp	10.00c.	11.00c.
Heavy Brass	7.50c.	8.25c.
Light Brass	5.75c.	6.25c.
No. 1 Yellow Brass Turnings	7.00c.	7.62½c.
No. 1 Comp. Turnings	9.25c.	10.00c.
Heavy Lead	3.75c.	3.90c.
Zinc Scrap	4.12½c.	4.37½c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins	Not longer than 72 ins.	20	21	21	21	21	22
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	22
	Longer than 96 ins.	20	21	21	21	21	23
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	20	21	21	21	21	23
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	23
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	21	22	24
	Longer than 120 ins	20	21	21	22	23	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	20	21	21	22	23	25
	Longer than 72 ins Not longer than 96 ins.	20	21	21	22	24	26
	Longer than 96 ins Not longer than 120 ins.	20	21	21	23	25	29
	Longer than 120 ins.	20	21	22	24	27	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	20	21	21	22	24	27
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	23	25	30
	Longer than 96 ins. Not longer than 120 ins.	20	21	22	24	27	
	Longer than 120 ins	21	22	23	25	29	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	20	21	22	24	29	
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26	31	
	Longer than 120 ins.	21	22	24	29		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	21	22	24	27		
	Longer than 96 ins. Not longer than 120 ins.	22	23	25	28		
	Longer than 120 ins.	23	24	26	30		
Wider than 108 ins.	Not longer than 132 ins.	24	25	27			
	Longer than 132 ins.	25	26	29			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.
For tinning both sides, double the above price.
For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, August 3, 1903

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb.................. 25c.
12 oz. and up to 14 oz. to square foot, per lb.............. 26c.
10 oz. and up to 12 oz...................................... 28c.
Lighter than 10 oz.. 31c.
Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26........	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28........	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.31
Above No. 10 to No. 16..	.23½	.27½	.31½
Nos. 17 and 18	.24	.28	.32
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING

From 2 in. to 3¾ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.
For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.....	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.......	33	20	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

	Per lb.
Plain Round Tube, ¾ in. up to 2 in., to No. 19, inc.	$0 35
" " " ⅝ " " ¾ " " 19, "	36
" " " ½ " " ⅝ " " 19, "	38
" " " ⅜ " " ½ " " 19, "	41
" " " 5/16 " " ⅜ " " 19, "	48
" " " ¼ " " 5/16 " " 19, "	65
" " " 3/16 " " ¼ " " 19, "	1 06
" " " ⅛ " " 3/16 " " 19, "	1 50
Smaller than ⅛ inch	Special
2 inch to 3 inch, to No. 19, inclusive	38
3 inch	40
Over 3 inch to 3½ inch	45
Over 3½ inch	50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than... And Including...	*3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier..	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 14	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 15	......	42	44	44	44	44	47	47	47	48	48	49	50	2	7
" 16	......	42	44	44	44	44	47	47	47	48	48	49	50	2	8
" 17	......	42	44	44	44	44	47	47	47	48	48	49	50	3	9
" 18	......	42	41	44	44	44	47	47	50	51	51	54	57	3	10
" 19	......	42	44	44	44	44	47	48	51	52	52	56	59	4	11
" 20	42	44	44	44	44	46	49	50	52	53	53	58	61	4	12
" 21	42	46	46	46	46	48	51	52	58	59	62	65	......	5	14
" 22	42	46	46	46	48	48	51	55	59	61	64	......	......	5	16
" 23	42	46	46	46	48	48	51	57	60	64	......	......	......	6	18
" 24	42	46	48	50	50	50	53	59	62	......	......	......	......	6	20
" 25	44	47	49	51	51	51	54	61	......	......	......	......	......	7	23
" 26	44	47	50	54	54	54	59	......	......	......	......	......	......	8	25
" 27	44	48	52	56	56	57	62	......	......	......	......	......	......	10	28
" 28	44	48	54	56	57	57	64	......	......	......	......	......	......	11	32
" 29	46	49	56	58	60	60	69	......	......	......	......	......	......	13	36
" 30	46	50	58	60	64	70	77	......	......	......	......	......	......	15	40
" 31	48	52	60	63	68	76	......	......	......	......	......	......	......	17	44
" 32	50	54	62	66	74	82	......	......	......	......	......	......	......	19	50
" 33	52	56	......	......	......	......	......	......	......	......	......	......	......	21	57
" 34	55	60	......	......	......	......	......	......	......	......	......	......	......	25	66
" 35 & 36	1 67	Not wider than 6 in.	......	......	......	......	......	......	......	......	......	......	......	Polished two sides double above prices.	Satin Finish two sides double above prices.
" 37 & 38	1 98		......	......	......	......	......	......	......	......	......	......	......		
" 39 & 40	2 22		......	......	......	......	......	......	......	......	......	......	......		
" .003" to .0015"	2 42		......	......	......	......	......	......	......	......	......	......	......		
Less than .0015"	2 66		......	......	......	......	......	......	......	......	......	......	......		

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds.......................10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.		Outside Diameter in Inches.
1-4	......	......	......	10	9	8	7		1-4
5-16	......	......	......	11	9	8	7		5-16
3-8	......	......	......	12	9	8	7		3-8
1-2	......	......	17	14	11	9	8		1-2
5-8	......	......	21	16	13	12	......		5-8
3-4	......	......	25	19	16	14	......		3-4
7-8	......	......	28	22	18	16	......		7-8
1	......	......	30	25	21	19	......		1 00
1 1-4	......	......	36	30	25	......	......		1 1-4
1 1-2	......	52	43	35	28	......	......		1 1-2
1 3-4	......	60	50	41	33	......	......		1 3-4
2	84	68	58	47	87	......	......		2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

nds.

list.

for

de
ter
hes.

.1-4
5-16
.3-8
.1-2
.5-8
.3-4
.7-8
00
1 4
1-2
3-4
00